men who can offer an adequate treatment of mustard, thermit and white phosphorus burns.

We all remember the hurried physical and mental examinations of our troops before their departure to France. Had we had adequate medico-military preparedness, much postwar grief would have been avoided. The draft boards rejected 500,000 men and passed 750,000 who were rejected and discharged from the Army camps on examination as unfit for military duty.

The part in which the military surgeon plays the most important rôle is the selection of men for military service. We are fortunate in having a splendid Veterans' Bureau to serve as a nucleus for our next campaign. The importance of accepting men is balanced by the necessity of accurate observation by the men in charge at the end of service for postwar ratings for disability compensation purposes. About $12,000,000,000 have been paid out in war pensions and compensation by the Government for war disabilities based on examinations by physicians.

The civilian physicians of today will be the medical officers of tomorrow. Military medicine differs from civilian practice in that it centers on two objectives—the prevention of disease and the conversion of casuals into rifle carriers. The last war brought home one great deficiency in the medical personnel—that of specialists. The hope of any man to continue in his specialty or to attach himself to a specialty in the next war, will lie in his preparation now and enrollment in the Reserve as a specialist. The formation of national boards for specialists allows acknowledged men to be correctly placed in the sphere of their greatest usefulness.

The Reserve was organized to perpetuate the framework of the organization developed in the World War. The medical veteran not only transmits his experience, but also sets an example for the younger generation in the Reserve who will in time become replacements. The various military sections, both in the Reserve and in the county medicals, might well sponsor courses in schools or forums toward medical military preparedness.

The coming convention of the Association of Military Surgeons will offer a well-balanced program along these lines. Their meeting at the Ambassador Hotel in Los Angeles, October 14-16, will be attended by surgeons from all parts of the world. The program will contain the latest information of military medicine as well as a glimpse into the future. There will be both scientific and commercial exhibits of note. Hence, members are urged to mark their calendars ahead for this timely meeting.

6777 Hollywood Boulevard.

HOWARD L. UPDEGRAFF,
Los Angeles.

Employment is nature's physician and is essential to human happiness.—Galen.

The peak of human physical efficiency is reached at about the age of twenty-four.

ORIGINAL ARTICLES

PNEUMONIAS: THEIR MANAGEMENT*

By JESSE G. M. BULLOWA, M.D.†
New York

PNEUMONIA ranks third among the causes of death. In the City of New York alone during the year 1935 there died from this disease 809 men and 292 women between the ages of twenty and fifty. If we consider the annual earnings of the males to have averaged $2,500, the approximate present worth of the net future earnings of these men would have amounted to twenty million dollars. I shall not attempt to value the earnings of the women.

WHAT SHOULD MANAGEMENT INCLUDE?

The management of the pneumonias should include the prevention of these diseases, which are largely carried by human vectors and spread by the ordinary contacts of business and pleasure. Prevention may ultimately be by means of immunization against the viruses of the common cold and influenza, which prepare for the subsequent bacterial invasion. Eighty per cent of my cases have the history of a head or chest cold preceding the chill or chest pain which marks the onset of pneumonia. It may, however, be more important to protect against the secondary invaders, which are the primary causes of the pneumonias. The work of Felton, with a group antigenic fraction of the pneumococci, may prove of great value. It is being evaluated in the Civilian Conservation Camps at the present time. Until active immunization is perfected, reliance must be placed upon the prompt segregation and cure of those who are stricken. Vaccination against the specific organisms involved in local epidemics is recommended and was successfully practiced by Smillie.[1] He described an epidemic due to Pneumococcus II in a veterans' hospital, which lasted two years and ceased after vaccination of the personnel of the pavilion infected.

CURATIVE MANAGEMENT

The curative management of the pneumonias concerns especially the pneumococci, because the large majority of the pneumonias are due to these organisms. The pneumococcic pneumonias are caused by a group of organisms morphologically and culturally similar, but immunologically separate and distinct. At least thirty-two types of pneumococci are now recognized, due to the brilliant and painstaking work of Georgia Cooper.

SERUM THERAPY

The present favorable position of serum therapy is due to (1) the prompt and precise method for

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† From the Littauer Pneumonia Research Fund, New York University and the Medical Service, Harlem Hospital, New York City.

This study received financial support in part from the Metropolitan Life Insurance Company and the Maurice Levin Fund.

TABLE 1.—*Effect of Bacteremia on Mortality by Day of Serum Treatment, Pneumococcus I Pneumonias, 1926-1936*

Day of Disease Serum First Given	Total Cases				Bacteremic Cases			
	Cases	Deaths	Per Cent	Error	Cases	Deaths	Per Cent	Error
One	17	0	0.0	....	1	0	0.0	....
Two	73	7	9.6	±3.5	15	4	26.6	....
Three	115	11	9.6	±2.7	17	6	35.3	....
Four	148	13	8.8	±2.3	36	9	25.0	±7.2
Five	160	24	15.0	±2.8	44	17	38.6	±7.3
Six	136	24	17.6	±3.3	35	19	54.4	±8.4
Seven	77	16	20.8	±4.7	18	10	55.6	....
Eight and later	142	31	21.8	±3.6	27	18	66.7	....
Onset unobtainable	6	2	.....	....	1	1	.....	....
Total	874	128	14.7	±1.2	194	84	43.3	±3.6
One through four	353	31	8.8	±1.5	69	19	27.6	±5.3
Five and later	515	95	18.4	±1.7	124	64	51.6	±4.5
Onset unobtainable	6	2	.....	....	1	1	.....	....
Total	874	128	14.7	±1.2	194	84	43.3	±3.6
One through six	649	79	12.2	±1.3	148	55	37.1	±4.0
Seven and later	219	47	21.4	±2.8	45	28	62.3	±7.2
Onset unobtainable	6	2	.....	....	1	1	.....	....
Total	874	128	14.7	±1.2	194	84	43.3	±3.6

identification of the responsible organism, and (2) to more adequate methods of administering potent refined and concentrated specific therapeutic sera. The determination of pneumococcus type may be made in 76 per cent of the cases by a direct Neufeld examination of the sputum. Where too few organisms are present, it may be necessary to propagate them in white mice, where they are usually found in the peritoneal exudate after three to four hours, or in the mouse blood after eight to ten hours. The organism obtained from the sputum is responsible for the pneumonia in 93 per cent of the cases, as shown by comparison with simultaneous or subsequent lung aspiration and blood culture.

ROUTINE BLOOD CULTURE

A routine blood culture should be taken to determine the presence of bacteremia, which does not always occur at the onset of the pneumonia. Most of the complications of pneumonia, as well as the deaths, are associated with bacteremia, and may be prevented by the adequate administration of serum. Large doses should be given early in the disease and the most potent serum should be used, as this gives more protection in a shorter time. With severe cases we endeavor to give the entire required dose at once, sometimes in a single intravenous drip, which dilutes the antibody, thus preventing reaction. Frequently, after a single dose of serum, there is a permanent fall of pulse and temperature, and specific agglutinins appear in the blood. The agglutinins in the blood serve as a "marker," *e. g.*, when there is very strong agglutination it is unnecessary to give additional serum, and if the pulse and temperature remain elevated another explanation must be sought. There may be invasion with an additional or a different type from that for which serum was given, a complication or serum sickness. When serum is given in adequate dose and early in the disease, there is a termination of the disease and absence of complications, and bacteremias are either prevented or cured.

COMMENTS ON RESULTS IN AN EIGHT-YEAR SERIES

The results for pneumococcus I pneumonia over a period of ten years are shown in the accompanying tables (1 and 2) which show the importance of early administration rather than the futility of late administration, and the profound influence of age and bacteremia on mortality.

In the first three years of these observations cases were alternated as they came to the service, the even-number cases receiving serum and the odd-number cases receiving no serum. In the no-serum series the mortality was 32 per cent, in the bacteremic no-serum cases the death rate was 75 per cent.

The reduction in mortality resulting from the use of serum in pneumococcus I pneumonias was also observed in other pneumonias, for which a serum of ample potency was procurable.

Our Harlem Hospital experience is not sufficient to establish statistically the value of serum therapy for pneumococcus II. However, when we combine our own with the experience of the Boston City Hospital, we find a very significant reduction in the death rate of the serum-treated cases. There were 259 cases with 120 deaths (46.3 per cent) in the non-serum treated cases, and 204 cases with 63 deaths (31 per cent) in the serum group. The difference in the death rate of the bacteremic cases is not significant. The incidence of bacteremia was higher in those treated without serum. The effect of early serum administration is shown in the table by decades. In Doctor Finland's series the mor-

TABLE 2.—*Effect of Early Use of Serum on Mortality by Decades, Pneumococcus I Pneumonias*

Age	Total Cases					
	First Through Fourth Day of Serum Treatment			Fifth Day of Serum Treatment and Later		
	Cases	Deaths	Per Cent	Cases	Deaths	Per Cent
12-19	33	0	0.0	42	3	7.1
20-29	109	7	6.4	133	12	9.0
30-39	83	4	4.8	124	20	16.1
40-49	46	8	17.4	77	10	13.0
50-59	13	4	30.8	34	15	44.1
60-69	6	2	33.3	8	2	25.0
70 and over	0	0	.....	6	3	50.0
Total	290	25	8.6	424	65	15.3
	Bacteremic Cases					
12-19	4	0	0.0	4	2	50.0
20-29	20	3	15.0	29	6	20.7
30-39	14	2	14.3	30	12	40.0
40-49	9	4	44.4	18	7	39.0
50-59	4	3	75.0	18	14	77.8
60-69	4	2	50.0	2	1	50.0
70 and over	0	0	.....	4	3	75.0
Total	55	14	25.4	105	45	42.8

tality in serum cases was 50 per cent, and in my own it was 42 per cent. In the table, serum mortality was 23.6 per cent in patients treated before the fifth day. In both series the death rate of patients treated on the first three days was only 20 per cent.

With serums for pneumococcus V, VII, and VIII, and a number of other types, such as XIV and XVIII (given in ample amount so as to very rapidly saturate the blood), the death rate is reduced significantly and the disease is terminated as dramatically as it occurs when serum is used in pneumonias due to pneumococcus I. Over a period of seven years at Harlem Hospital the death rate in pneumococcus V has been 20 per cent; when strong serum was given in sufficient amounts, the death rate was reduced to 11.5 per cent when a moderately potent serum was used (780 units per cubic centimeter) and to 5 per cent when a very potent serum (3100 units per cubic centimeter) was employed.

In pneumococcus XVIII the death rate over a period of eight years has been 26 per cent. In the serum-treated cases it is approximately 6 per cent. Of twelve cases of bacteremia which received no serum, nine patients died. Only one of five cases treated with serum died.

When adequate amounts of serum do not cause a termination of the disease, as evidenced by fall of pulse and temperature, it is because there is (1) a mistyping and the serum is not specific, (2) a second invading type, (3) a complication due to the type involved, or (4) serum sickness from the serum used. This leads to a discussion of adequate dosage. Adequate dosage is sufficient serum given in a short period to sensitize every organism. It cannot be expressed for every patient in cubic centimeters or units. If some organisms are not sensitized, there is always an opportunity for them to escape into the circulation and multiply. I contrast two cases of pneumococcus VII pneumonia. One, where small doses were given to a bacteremic patient in whom there was a temporary recession of the bacteremia and ultimately a multiplication of the cocci, which was not controlled by later doses of serum. Another patient entered with pulmonary edema on the eighth day of her disease. She had 300 colonies per cubic centimeter of her blood; 400,000 units of concentrated rabbit serum was given. The organisms multiplied and the next day 700 colonies were found. The dose of serum was repeated, and she received 1,800,000 units; the blood stream became sterile and the patient is well.

THERAPEUTIC RABBIT SERUM

A recent development is the employment of therapeutic rabbit serum. This has certain advantages. It has in many instances a greater initial potency before concentration. The protective antibody is in the water-soluble fraction, and is part of or associated with a smaller molecule than in horse serum, so it may penetrate tissues which are impenetrable for horse serum. No prozone has been observed, and it is not inactivated by certain common lipids. Because of the smaller animal and the more rapid production of antibody, it may be possible to have serum for types which would not be made if it were necessary to rely on horses. Two varieties of rabbit serum are being studied. Through the courtesy of Doctors Goodner and Horsfall of the Rockefeller Institute Hospital, I am using a processed serum which has had the chill factors largely removed by heating to 58 degrees for one-half hour, and by absorption with washed kaolin. This preparation gives few chills when preceded by aspirin. The other is a concentrated rabbit

TABLE 3.—*Effect of Early Use of Serum on Mortality by Decades, Pneumococcus II Pneumonias*

Age Group	Serum Before Fifth Day			Serum Fifth Day or Later			Non-Serum Mortality		
	Cases	Deaths	Per Cent	Cases	Deaths	Per Cent	Cases	Deaths	Per Cent
12-19	5	0	0.0	6	1	16.7	6	0	0.0
20-29	19	2	10.5	17	5	29.4	35	9	25.7
30-39	15	5	33.3	23	13	56.5	31	12	38.7
40-49	11	5	45.5	12	3	25.0	20	12	60.0
50-59*	3	1	33.3	3	2	66.6	12	7	58.3
60-69	2	0	0.0	1	1	100.0	4	2	50.0
70 and over	....	....	.....	....	....	....	3	2	66.7
Total	55	13	23.6	62	25	40.4	111	44	39.7

* Additional death. Day unknown.

serum; preparations containing 20,000 units per cubic centimeter have been made. Although fewer patients seem to be sensitive to rabbit serum than to horse serum, it is impossible to test for sensitivity to rabbit serum by the dermal reaction because a skin reaction is frequent. Sensitivity is tested by administering a small amount, one-tenth cubic centimeter in five cubic centimeters of saline intravenously. If there is less than 20 millimeters fall of blood pressure after five minutes, the patient is not sensitive.

Allergy to other than the specific serum is not a contraindication to the use of serum. We give horse serum to patients suffering from asthma when the asthma is not due to horse serum.

It is of great value to possess antibodies for the different types of pneumococci in two animals, so that when a patient is sensitive to one the other may be used, but it is not essential.

Patients may be sensitive to sera from two animals.

REPORT OF CASE

A high-school boy, age sixteen years, took suddenly ill at 10 a. m. on April 9, 1937, with generalized aches and pains, malaise, cough with occasional expectoration of clear sputum, fever and headache. He stayed at home in bed. With the onset of the illness, he felt nauseous and could not eat.

April 11—10:30 a. m. Acutely ill, in no distress with hot, dry skin, moist tongue and injected pharynx. Chest: Lungs, vesicular respiration throughout, occasional crepitant râles over right lower lobe. Abdomen soft; no distention. 11 p. m.—Blood culture was negative.

April 12—9 a. m. The patient persists in complaint of pain in abdomen. Sputum bloody, tenacious; no organisms. Blood culture was negative.

April 13—9:45 a. m. Chill. The patient had cough productive of blood-streaked sputum. Pain in left lower chest. Over left lower lobe, dullness to percussion, bronchial breath sounds, bronchophony, and crepitant râles. Neufeld Pneumococcus I. Blood culture was negative.

2:30 p. m.—Blood culture was negative.

Sensitivity to horse serum.

4 p. m.—Ophthalmic—Sclera became injected after five minutes. Intradermal—Saline negative, horse serum 1:100 in two minutes, large urticarial eruption around injected area; wheal two centimeters in diameter surrounded by erythematous ring, four centimeters in diameter. Reaction caused itching over entire forearm. No systemic reaction.

O_2 with nasal inhaler at four liters per minute.

X-ray—Increased density of left lower lobe.

8:30 p. m.—Blood culture was negative.

April 14—12 noon. Bronchial breathing over left lower lobe. Diminished breathing over left upper lobe. Mouse Brain—Pneumococcus I.

SERUM SENSITIVITY TEST: RABBIT SERUM

1 p. m.—Rockefeller Rabbit Serum Processed, Pn. I, Lot No. 2.1.6. One-tenth cubic centimeter in five cubic centimeters physiological saline, given intravenously.

Blood pressure before injection was 108/50; pulse, 100; respiration, 32. Blood pressure two minutes after injection was 70/50; pulse, 110; respiration, 36. After injection the patient wanted to sneeze, became dyspneic. 1:02 p. m.—The patient became restless, dyspneic and cyanotic; musical râles throughout entire chest, profuse perspiration, pulse thready, urticarial eruption over face and arms. Edema of eyelids. The patient was given one cubic centimeter of adrenalin and O_2 at eight liters per minute. Condition improving slowly.

Therapeutic rabbit serum injection by Doctor Horsfall.

April 13—8:45 p. m. Infusion of 5 per cent glucose in normal saline begun, six cubic centimeters (180 drops) per minute.

8:48 p m.—Adrenalin subcutaneously, M IV. All intravenous injections given into tube 18 inches from vein.

Hour	Dilution in Normal Saline	Time
8:55	0.5 cc. serum to 20 cc.	23 min.
9:21	1.0 cc. serum to 20 cc.	7 min.
9:32	2.0 cc. serum to 20 cc.	6 min.
9:40	4.0 cc. serum to 20 cc.	4 min.
9:46	8 cc. serum to 20 cc.	4 min.
9:54	16 cc. serum to 20 cc.	6 min.
10:04	20 cc. serum no dilution	6 min.
10:12	20 cc. serum no dilution	4 min.
10:18	20 cc. serum no dilution	3 min.
10:22	20 cc. serum no dilution	4 min.
10:26	7 cc. serum no dilution	½ min.

11 p. m.—Shaking chill lasting ten minutes.

Temperature before chill, 102.4; pulse, 100; respiration, 30.

One-half hour after chill—Temperature, 105.4; pulse, 110; respiration, 32.

Next morning—Temperature, pulse, and respiration were normal.

COMMENT

As you may gather from the data presented, the early use of specific serum terminates the pneumonia. In many of my patients who have received serum on the first or second day, the patients are discharged on the eighth or ninth day completely recovered and feeling able to work.

Sulfanilamide has been used in some of the pneumococcic pneumonias. There is evidence that it may be of value for its bacteriostatic action in patients suffering from pneumococcus III. Three cases, from whose blood a few colonies of pneumococcus III were recovered, received sulfanilamide and recovered. Two patients with heavy invasions

did not recover, although there had been a temporary diminution in the number of organisms. The drug is not without deleterious side effects. It may depress bone-marrow function and reduce the activity of leukocytes. It causes sulfhemoglobinemia evidenced by severe cyanosis. In one case 6 grams of the 15 grams of hemoglobin per 100 cubic centimeters of blood (about 40 per cent) was so converted. The patient had a ghastly aspect for several days after the drug was discontinued.

In some communities, and in some epidemics, streptococcic pneumonias may be of great importance. Pneumonias may be induced by Streptococcus alpha or Streptococcus beta, but very rarely by Streptococcus gamma. The pneumonias due to Streptococcus alpha have been either very mild or have induced empyema. In one patient a brain abscess developed. Pneumonia due to Streptococcus beta may be due to one of the twenty-seven different types of Griffith. Where the types which cause scarlet fever are present, convalescent scarlet fever serum has induced a critical termination. This serum did not, however, prevent development of empyema. The streptococcic pneumonias cause early pleural effusion. We have also had excellent results in pneumonias due to Streptococcus hemolyticus from an adequate administration of sulfanilamid, especially in those cases where an organism has been recovered by lung suction, and the blood culture has been sterile.

IN CONCLUSION

Unfortunately the precise diagnosis of pneumonia, including the type, may not be made until several days have elapsed. Under such conditions, much larger doses of serum must be employed, and opportunity for marked disturbances in metabolism and destruction of necessary body ingredients have occurred.

A thorough knowledge of physiology and pharmacology is required for the treatment of pneumonia. There is no disease where the emergencies are more sudden and more menacing. Because of the consolidation of the lungs, ability to absorb oxygen is restricted. The oxygen deficiency leads to changes in the circulation and the nutrition of the brain, so that restlessness and delirium are frequent. In addition, through the skin and gastrointestinal tract there may be marked losses of water and salt, and exhaustion of hormones leading to loss of tissue turgor. On this account there must be a careful selection of sedatives, while extreme vigilance is exercised in nursing and feeding.

SUMMARY

The management of the pneumonias depends upon etiologic differentiation, and a serotherapy is available which saves lives and shortens illnesses. Serotherapy and chemotherapy are available for the Streptococcus beta. The principles involved in serotherapy and chemotherapy are indicated.

62 West Eighty-seventh Street.

REFERENCE

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THE PRACTICE OF PEDIATRICS AS A SPECIALTY*

By E. B. SHAW, M.D.
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THE pioneers of pediatrics, a small and scattered group, are only the immediate predecessors of most of us who comprise the second group in this specialty. Ours is a young specialty, and in our generation we have been enabled to observe a great part of its development and definition, many things which constitute the chief activities of the present-day pediatrician, have been developed during this time.

Pediatrics is a direct outgrowth, or at least a concomitant development, of a new idea in intensive puericulture. The old scheme of rearing children was based on the sound biologic law of the survival of the fittest. Children were produced in abundance and an effort was made to supply them with their needs for subsistence but they thrived or not, survived or not, largely dependent on their own inherent powers in the struggle for existence. This older method is biologically sound but economically not so tenable. Thereby was produced a hardy race of survivors, a certain percentage of cripples, and many of the weaker were removed by natural processes.

The modern method is based on a desire for smaller families, accomplished by methods of birth control, with the idea of giving every individual maximum opportunity for obtaining his best possible degree of development—physically, mentally, and culturally. During the last two or three decades the average span of life has been materially lengthened; this result has largely been secured through improvement of health and nutrition during the early years of life. The ultimate result of the improved care of childhood on the physical status of later life is still to be demonstrated but it is not unlikely that there will be unpredictable remote effects in the later years of future generations as the result of such an extensive biologic experiment. Not long ago the chief problems of child health were the product of scarcity of certain essentials, our generation has created some new problems of superabundance.

Formerly most children were born at home—as a matter of fact were delivered sight unseen beneath the bedcovers. This resulted in poor obstetrics and primitive asepsis but only the fittest were expected to survive and asepsis was not nearly so important as later when cases were crowded into hospitals. The mother nursed her baby as a matter of course. As long as she had sufficient milk she needed very little help with the nutrition of her baby and gradually maternal nursing was supplemented by casual additions from the family table. Of course, if the mother's milk supply was inadequate the problem of artificial feeding was extremely complicated and hazardous, and infant mortality in these cases was appallingly high.

* Chairman's address before the Pediatrics Section of the California Medical Association at the sixty-sixth annual session, Del Monte, May 2-6, 1937.